WHAT IS CLAIMED IS:

1. A method for forming a planar, non-polar, a-plane gallium nitride (GaN) film on a substrate, comprising:

(a) loading a substrate into a reactor;

(b) heating the reactor to a growth temperature;

(c) reducing the reactor's pressure to a desired deposition pressure, wherein the desired deposition pressure is below atmospheric pressure;

(d) initiating a gaseous hydrogen chloride (HCl) flow to a gallium (Ga) source to begin growth of the a-plane GaN film directly on the substrate, wherein the gaseous HCl reacts with the Ga to form gallium monochloride (GaCl);

(e) transporting the GaCl to the substrate using a carrier gas that includes at least a fraction of hydrogen (H_2), wherein the GaCl reacts with ammonia (NH_3) at the substrate to form the GaN film; and

(f) after a desired growth time has elapsed, interrupting the gaseous HCl flow, returning the reactor's pressure to atmospheric pressure, and reducing the reactor's temperature to room temperature.

2. The method of claim 1, wherein the substrate is a sapphire substrate,

3. The method of claim 1, wherein the substrate is coated with a thin film of GaN, aluminum nitride (AlN), or aluminum gallium nitride (AlGaN).

4. The method of claim 2, wherein the substrate is coated with a nucleation layer deposited either at low temperatures or at the growth temperature.

5. The method of claim 1, wherein the substrate is a free-standing GaN, aluminum nitride (AlN), or aluminum gallium nitride (AlGaN) film.

6. The method of claim 1, further comprising evacuating the reactor and backfilling the reactor with purified nitrogen (N_2) gas to reduce oxygen and water vapor levels therein before heating the reactor.

7. The method of claim 1, further comprising nitridating the substrate, at a temperature in excess of 900°C;

8. The method of claim 7, wherein the nitridating step comprises adding anhydrous ammonia (NH_3) to a gas stream in the reactor to nitridate the substrate.

9. The method of claim 1, wherein the heating step (b) comprises heating the reactor to the growth temperature of approximately 1040°C, with a mixture of hydrogen (H_2) and nitrogen (N_2) flowing through all channels in the reactor.

10. The method of claim 1, wherein the gaseous HCl reacts with the Ga at a temperature in excess of 600°C to form the GaCl.

11. The method of claim 1, wherein the desired deposition pressure ranges from 5 to 100 Torr.

12. The method of claim 1, wherein the desired deposition pressure is approximately 76 Torr.

13. The method of claim 1, wherein typical growth rates for the GaN film range from 1 to 50 μm per hour.

14. The method of claim 1, wherein the interrupting step (f) further comprises including anhydrous ammonia (NH_3) in a gas stream to prevent decomposition of the GaN film during the reduction of the reactor's temperature.

15. The method of claim 1, wherein the interrupting step (f) further comprises cooling the substrate at a reduced pressure between 5 and 760 Torr.

16. A device manufactured using the method of claim 1.

17. The device of claim 16, wherein the device is a laser diode, light-emitting diode or transistor.

18. A planar, non-polar, a-plane gallium nitride (GaN) film deposited on a substrate, wherein the GaN film is created using a process comprising:

(a) loading a substrate into a reactor;

(b) heating the reactor to a growth temperature;

(c) reducing the reactor's pressure to a desired deposition pressure, wherein the desired deposition pressure is below atmospheric pressure;

(d) initiating a gaseous hydrogen chloride (HCl) flow to a gallium (Ga) source to begin growth of the a-plane GaN film directly on the substrate, wherein the gaseous HCl reacts with the Ga to form gallium monochloride (GaCl);

(e) transporting the GaCl to the substrate using a carrier gas that includes at least a fraction of hydrogen (H_2), wherein the GaCl reacts with ammonia (NH_3) at the substrate to form the GaN film; and

(f) after a desired growth time has elapsed, interrupting the gaseous HCl flow, returning the reactor's pressure to atmospheric pressure, and reducing the reactor's temperature to room temperature.